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JAUNDICE FOLLOWING ADMINISTRATION OF HUMAN SERUM [1]

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Jaundice following the inoculation of materials containing homologous serum is by no means a new condition. During recent years certain outbreaks have served to focus attention on the condition. Its relation to other diseases in which jaundice is a major symptom has not been established with clarity and its etiology has not been definitely proved. It is the purpose of this paper to present evidence regarding the nature of the agent responsible for this disease.

Hirsch (*1*) records an outbreak of jaundice among individuals vaccinated with "humanized lymph in glycerine." Among 1,289 persons vaccinated, 191, or 14.8 percent, developed jaundice after incubation periods "extended to several weeks and even to a couple of months." No cases developed among 500 persons vaccinated with a different lymph.

In 1918 Theiler (*2*) reported a condition known as "staggers" in horses, which followed administration of homologous serum. Jaundice was a marked sign. The incubation period varied from 27 to 165 days and the mortality varied from 4 to 18 percent among large groups of immunized horses. Slagsvold (*3*) found that 101, or 4.2 percent, of 2,400 horses treated with anthrax serum developed liver damage from 8 to 95 days following injection of the serum. In most cases the elapsed period was 50 to 60 days. A similar condition in horses following the administration of equine encephalomyelitis vaccine containing homologous serum has been observed in this country (*4*, *5*).

MacNalty (*6*) drew attention to the occurrence of jaundice among 37 of 82 to 109 persons who had been given convalescent measles serum from the same pool of material. Seven deaths were recorded. Convalescent measles serum in doses of 4.5 cc. was given to seven children

[1] From the Division of Infectious Diseases, National Institute of Health.

of other cases of hepatitis developed following the use of mumps con-

and in 78 to 83 days these children developed severe jaundice. Three cases terminated fatally. Two months later two children who had been in contact with the previous cases developed mild infective hepatitis (*7*).

Findlay and MacCallum (*8*) found that hepatitis was a complicating factor in the use of yellow fever vaccines. Different types of vaccines used produced jaundice; the only common factors in the products were human serum and the attenuated virus of yellow fever. During a 5-year period 3,100 persons were immunized against yellow fever and 89, or 2.87 percent, of these developed jaundice. The average incubation period was 2 to 3 months with a range of 36 days to 7 months. Hepatitis has been associated with the use of yellow fever vaccine by other workers. Soper and Smith (*9*) described the first series of cases occurring in South America. A vaccine containing immune monkey serum and tissue culture virus was used. Among 244 persons immunized, 66, or 27 percent, developed hepatitis. The incubation period was prolonged.

Fox and his coworkers (*10*) have studied two outbreaks of hepatitis following the use of yellow fever vaccine in Brazil. In 1939, 304 persons were immunized and 27 percent suffered from hepatitis during the fourth and fifth months following immunization. In 1940, 35 lots of vaccine were used to vaccinate 107,169 persons. There were only 93 cases, or 0.1 percent, of jaundice among 87,878 persons given material from 33 lots of vaccine. Two other lots produced a greater amount of jaundice among the recipients. The attack rate with one lot used in 9,604 individuals was 7.68 percent and for another used in 9,587 persons the rate was 1.56 percent. The average incubation period was 24.8 weeks for the 33 lots of vaccine, 17.8 weeks for the lot producing the highest attack rate of icterus, and 20.4 weeks for the other lot. A total of 25 deaths was recorded.

Recent Army experience with yellow fever vaccine resulted in 28,585 cases of hepatitis with 62 deaths as of July 24, 1942 (*11*).

Immunization against pappataci fever has also resulted in the appearance of jaundice after a prolonged period. The method used for immunization consisted of separate inoculations of virus and antiserum. Virus was obtained from human blood during the acute stage of the disease. Sergiev et al. (*12*) studied 109 cases of jaundice resulting from the use of such materials. The incubation period varied from 63 to 146 days; about 50 percent of the cases occurred between 85 and 95 days after inoculation. About 30 percent of those vaccinated subsequently developed hepatitis.

A recent communication (*13*) attributes 48 cases of jaundice with 8 deaths to the use of pooled convalescent and adult human serum for measles. Incubation periods ranged from 16 to 161 days. A total of 12 cases of jaundice due to transfusion were also recorded. A number

of other cases of hepatitis developed following the use of mumps convalescent serum. The writers conclude that, "Any doubt as to the reality of the association is removed by the frequency with which hepatitis has followed the injection of human blood products."

Findlay and Martin (*14*) present evidence that an "infective icterogenic agent" is present in the nasopharynx of individuals developing hepatitis following yellow fever immunization. While some doubt might be maintained concerning two of the cases produced by this experimental approach, the evidence concerning the third case is convincing. Voegt (*15*) attempted to transmit the agent of infective hepatitis from one person to another with results which are suggestive, if not conclusive.

Some confusion exists regarding the relation of jaundice following administration of homologous serum and the disease known as infectious hepatitis, epidemic catarrhal jaundice, or infectious jaundice. It would appear from the work of Cullinan (*16*), Pickles (*17*), and others that infectious jaundice is spread by droplet infection and has an incubation period varying from 20 to 40 days. On the other hand, few secondary cases have been attributed to association with cases of jaundice following the administration of homologous serum and in this disease the incubation period is prolonged considerably over that of infectious jaundice. A recent editorial (*18*) expresses the problem admirably.

Many attempts have been made to isolate the etiological agent of infective jaundice and of jaundice following the administration of homologous serum in animals with negative results. Although no significant data have been accumulated it has been assumed that the causal agent is a virus.

The opportunity to study hepatitis following the use of yellow fever vaccine presented itself when an outbreak occurred in the Virgin Islands in the summer of 1942. Sufficient epidemiological evidence was accumulated to establish the identity of the disease and material was obtained for study of the causative agent. Human volunteers were available for experimental work. The results of such studies form the basis of this report and furnish some evidence concerning the nature of the responsible agent.

EPIDEMIOLOGY

During 1942 a total of 11,358 individuals on the islands of St. Thomas and St. John, Virgin Islands, was inoculated with lot 331 yellow fever vaccine containing pooled human serum. According to reliable data there are 11,265 persons living on the island of St. Thomas and 765 on the island of St. John, but due to wartime increases in population these figures may be too low. There were 11,147 persons vac-

of jaundice. Vomiting also occurred and varied considerably in

cinated with yellow fever vaccine on St. Thomas between March 4 and March 28, 1942, and 211 persons vaccinated on St. John on April 17, 1942. The same lot of vaccine was used throughout the immunization procedure. The dates of vaccination together with the numbers of persons vaccinated are given in table 1.

TABLE 1.—*Dates of immunization and numbers of persons vaccinated with yellow fever vaccine in the Virgin Islands*

Date immunized, 1942	Place	Number immunized	Date immunized, 1942	Place	Number immunized
Mar. 4	St. Thomas	490	Mar. 16	St Thomas	1,554
Mar. 5	do	403	Mar. 18	do	1,505
Mar. 6	do	624	Mar. 20	do	2,568
Mar. 9	do	1,134	Mar. 23	do	298
Mar. 10	do	392	Mar. 28	do	410
Mar. 11	do	596	Apr. 17	St. John	211
Mar. 12	do	597			
Mar. 13	do	576	Total		11,358

Jaundice was first noted in May, and by June 2, 1942, about 50 cases had been observed. During the next two weeks it was estimated that between 300 and 500 cases occurred. In order to obtain some exact knowledge concerning the incidence of the disease following the administration of vaccine, a survey was done in the city of Charlotte Amalie, St. Thomas, between July 6 and July 16. A group of 1,198 persons was studied. This sample is roughly 10 percent of the population involved. The data obtained from this survey are included in table 2. It was established that 14.7 percent of the vaccinated individuals developed symptoms of hepatitis following vaccination and that the incidence was greatest in the age groups between 20 and 59 years. Among 159 persons who were said not to have been vaccinated, 3 cases occurred. Inasmuch as the vaccination records were not adequate it is somewhat difficult to assess the significance of these cases.

Conditions were not suitable for accurate determination of the incubation period. Among a group of 75 patients from whom reliable and observed data could be elicited the average period between immunization and development of hepatitis was 103 days with a range of 75 to 130 days.

The disease was similar to that noted by other observers. Clinically, the disease varied considerably from very mild to extremely severe cases. Onset usually began with headache, pains in the shoulders and back, and frequently with pains in the fingers. A sensation of fullness in the epigastrium was quite characteristic and with this was associated anorexia and nausea. Weakness was a common complaint. Within a day or so the urine was noted to be very dark and within 2 to 3 days icterus of the sclerae appeared. Constipation and clay-colored stools were noted during the period

of jaundice. Vomiting also occurred and varied considerably in severity. Usually vomiting was limited to one or two episodes but in a few instances was persistent, leading to marked dehydration.

TABLE 2.—*Sample survey of Charlotte Amalie, Virgin Islands, showing incidence of jaundice following yellow fever immunization*

Age	Vaccinated population			Unvaccinated population			Total		
	Number surveyed	Number of cases of hepatitis	Percent with hepatitis	Number surveyed	Number of cases of hepatitis	Percent with hepatitis	Number surveyed	Number of cases of hepatitis	Percent with hepatitis
Under 1	31	0	7.5	17			297	20	6.7
1–4	127	11		13					
5–9	107	9		2					
10–14	120	16	11.8	3			260	29	11.3
15–19	125	13		12					
20–24	119	19	18.8	16			236	40	16.9
25–29	88	20		13	1				
30–34	76	20	21.1	11			153	28	18.3
35–39	57	8		9					
40–44	45	8	22.8	6			77	16	20.8
45–49	25	8		1					
50–54	48	9	21.4	4			85	15	17.7
55–59	22	6		11					
60–64	18	2	12.2	13	[2] 1		90	8	8.9
65–69	19	2		10					
70+	12	2		18	1				
	1,039	[1] 153	14.7	159	3	1.9	1,198	256	13.0

[1] Including 12 cases with all signs and symptoms except icterus.
[2] 1 case with all signs and symptoms except icterus.

There were cases which presented only dark urine, anorexia, vomiting, headache, and pains with no frank jaundice, while other cases remained jaundiced for at least a month. The average individual was jaundiced for about 6 to 10 days. The degree of illness did not appear to be closely associated with the duration of icterus as many who were jaundiced for a considerable period were ambulatory throughout the illness, while some who were jaundiced only a few days were bedridden during the period.

It seems evident from the standpoint of the previous history of immunization, the prolonged incubation period, and clinical symptoms that the disease under observation was identical with that previously described and designated as homologous serum jaundice.

Under the conditions of the outbreak it was deemed wise to attempt to limit our collection of possible infectious material to blood or serum which could be shipped under suitable conditions. Many samples were taken and from these nine were selected for experimental use, These are tabulated in table 3.

TABLE 3.—*Data concerning Virgin Islands serums used in pool for experimental groups 2 and 6*

Number	Date vaccinated, 1942	Date jaundiced, 1942	Date bled, 1942	Results of quantitative van den Bergh test	Remarks
				(mg. per 100 cc.)	
6	Mar. 4	June 22	July 6	0.68	
11	Mar. 16	June 28	do	1.07	
30	Mar. 4		July 8	.62	
40	Mar. 20		do	.56	
43	Mar. 6		do	1.16	
47	Mar. 6	July 7	do	.84	
49	Mar. 4		do	.14	Later developed jaundice.
52	Mar. ?	June 18	do		Icteric.
SJA	Apr. 17	July 14	July 17		Do.

EXPERIMENTAL STUDY

Volunteers were obtained in an institution with a population of about 1,700. Those selected were of both sexes in equal numbers and ranging in age from 15 to 57. Groups were inoculated with different materials as explained in table 4.

The following is an explanation of the inoculum used for each group:

Group 1. Lot 331. Yellow fever vaccine in recommended dose. This vaccine contained pooled human serum and is of the same lot which produced jaundice in the United States Army and in the Virgin Islands.

Group 2. Pooled serum collected from nine individuals in the Virgin Islands who had received lot 331 vaccine. Serum was diluted 1:5. Dose 0.5 ml. subcutaneously. See table 3.

Group 3. Lot 367. Dried yellow fever vaccine containing human serum heated in 56° C. water bath for 30 minutes before dilution. Given in recommended dose.

Group 4. Pooled weekly specimens of serum from a mild case of jaundice in group 1. Serum dilution 1:3. Dose 0.5 ml.

Group 5. Pooled weekly specimens of serum from a mild case of jaundice in group 2. Serum dilution 1:3. Dose 0.5 ml.

Group 6. Pool of same serum specimens used in group 2. Serum dilutions 1:3. Dose 0.5 ml. See table 3.

Group 7. Pooled weekly serum specimens from a severely jaundiced patient in group 1. Dilution 1:3. Dose 0.5 ml.

Group 8. Pooled weekly serum specimens from a moderately jaundiced patient in group 1. Dilution 1:3. Dose 0.5 ml.

Group 9. Lot 367. Yellow fever vaccine diluted as recommended and heavily irradiated with ultraviolet light, 1 hour at 2650 Å and 1½ hours at 2537 Å.

Group 10. Pooled weekly serum specimens taken before appearance of jaundice; from patient in group 1. Serum dilution 1:3. Dose 0.5 ml.

Group 11. Single serum specimen from same individual as in group 10. Specimen taken about 2½ months after jaundice had subsided. Serum dilution same as in group 10.

TABLE 4.—*Summary of groups inoculated showing incidence of jaundice*

Group	Number in group	Inoculum	Cases of jaundice		Sex of patient	
			Number	Percent	Male	Female
1	50	Yellow fever vaccine	12	24	6	6
2	10	Pooled Virgin Islands serum	2	20	2	0
3	10	Heated yellow fever vaccine	2	20	1	1
4	10	No. 31 serum	0	0		
5	10	No. 59 serum	0	0		
6	20	Pooled Virgin Islands serum	6	30	3	3
7	20	No. 38 serum	3	15	1	2
8	20	No. 13 serum	1	5	1	
9	10	Irradiated yellow fever vaccine	0	0		
10	14	No. 38 prejaundice serum	4	28.7	2	2
11	15	No. 38 postjaundice serum	0	0		
Total	189		30		16	14

Each serum given was diluted with phosphate buffered normal saline solution, pH 7.6, Berkefeld N filtered and cultured for sterility. Inoculation was always subcutaneous into the arm. The serum used had been stored routinely at 4° C. for varying periods.

All persons inoculated were subsequently bled weekly for 4 to 5 months. The serum was separated the same day and a quantitative van den Bergh test was done (*19*). Readings were made in a comparator using cobaltous sulfate standards.

Total leucocyte counts and differential counts were done weekly on the first few groups. No significant variation due to jaundice was seen in either. Schilling counts were then done routinely each week and these have also failed to show any variation in jaundiced patients.

Moss blood grouping was done for each subject. No correlation between these groups and susceptibility to jaundice was found.

The cephalin-cholesterol flocculation test of Hanger (*20*) has been done weekly on each serum specimen. Invariably the test is strongly positive when clinical jaundice is present. In the subclinical range in our experience, the test may or may not be strongly positive. Many +, ++, +++ reactions have been seen in individuals who were in normal health so far as known. Difco antigen was used.

For statistical purposes jaundice has been considered to be present when the serum bilirubin value was 1.0 mg. percent or higher. Clinical jaundice was usually not seen until the serum bilirubin value was 2.0 mg. percent or higher. A short summary of 30 cases of jaundice is given in table 5.

TABLE 5.—*Statistical summary of cases of jaundice*

	Range	Average	Median	Mode
Incubation period in weeks	4–19	12.3	12	12
Serum bilirubin mg. percent (maximum observed)	1.0–32.0	5.3	3.0	
Duration of jaundice, in weeks	1–7	2.1	2	2

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In two cases of jaundice a biphasic rise in serum bilirubin was seen. Both cases occurred in group 1. In one case the first rise occurred after 3 weeks and reached 1.1 mg. percent. In the thirteenth week a second rise to 3.2 mg. occurred with a further rise to 10.0 mg. the following week. In the other case the first rise occurred after 5 weeks, reaching 1.8 mg. in the eighth week with a secondary rise to 1.7 mg. in the fourteenth week.

Clinically most cases were quite mild; epigastric discomfort and nausea were commonly present shortly before jaundice appeared. Vomiting occurred in a few cases. Clay-colored stools and dark urine were present during jaundice. Slight fever up to 100°–101° F. was noted in a few cases. Anorexia was commonly present during jaundice. Most jaundiced patients remained ambulatory. Dermatitis and arthritis were not seen.

So far as known no contact cases of jaundice occurred. Only three cases of jaundice have appeared in 1,500 uninoculated individuals not included in this study during the past 11 months among the institution's population of about 1,700. During one period of 4 months 40 uninoculated individuals having close contact with the inoculated group in which jaundice was occurring were bled weekly and no evidence of jaundice was found.

The duration of jaundice correlated with the severity of the cases. In the 7 cases with the longest duration, ranging from 3 to 7 weeks, the average maximum serum bilirubin observed was 11.7 as compared with the average of 5.3 for the whole group.

Attempts were made to transmit jaundice in animals using materials which produced disease in humans. These included yellow fever vaccine as well as serums derived from patients in the Virgin Islands and from persons exhibiting jaundice produced experimentally. Monkeys, pigs, rabbits, guinea pigs, white rats, Swiss mice, cotton rats, and hamsters were employed. In no instance were we able to produce any illness in experimental animals which could not be accounted for by other agents and no animals became jaundiced as determined by physical or chemical examinations.

Dr. E. W. Goodpasture supplied specimens of liver from fatal cases of jaundice which occurred following the use of vaccines. This material was used an an antigen in complement fixation tests designed to determine whether or not antibodies were present following recovery from this type of hepatitis. In a limited series of tests, negative results were obtained.

COMMENT

It was recognized in 1942 during an epidemic of jaundice in the United States Army that some agent in human serum employed as a diluent in yellow fever vaccine was probably responsible. The yellow

fever vaccine now in use does not contain serum and so far as known has not produced jaundice.

There is an urgent need either for some means of detecting the presence of the jaundice-producing agent in the blood or for some practical method for treating blood products so that the danger of jaundice following their use may be eliminated.

SUMMARY

Results of a sample survey of an epidemic of jaundice occurring subsequent to vaccination against yellow fever in the Virgin Islands in 1942 are given.

Jaundice was produced experimentally by inoculation of two lots of yellow fever vaccine containing pooled human serum.

Jaundice was produced by the inoculation of small amounts of filtered serum from two individuals, and a group of nine individuals who had previously received yellow fever vaccine containing human serum.

The jaundice-producing agent is filterable, survives drying in vacuum, storage for long periods in serum at 4° C., and heating to 56° C. for one-half hour in the dried state.

Evidence is presented that the jaundice-producing agent is present in the blood before jaundice appears, but not 2½ months after disappearance of jaundice.

Evidence is presented suggesting that the jaundice-producing agent may be neutralized by ultraviolet irradiation.

Both sexes are apparently equally susceptible.

Transmission of this type of jaundice by ordinary contact apparently has not occurred during this study.

Attempts to produce jaundice in experimental animals and to develop a complement fixation test were unsuccessful.

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TOXIC EFFECTS OF ATABRINE AND SULFADIAZINE IN GROWING RATS [1]

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When white rats were given atabrine by stomach tube in ascending doses near the limit of tolerance for 2 months and then killed, a striking pathologic picture was found. It is the purpose of this paper to present these changes and to outline the conditions under which they were produced.

Fifty female white rats in individual cages and on a stock diet were divided into five groups of ten rats each. Over a period of approximately 8 weeks the first group (A–1) received atabrine daily by stomach tube. The dose was increased at intervals from 20 mg. to 80 mg. per kg. as indicated in figure 1. After each increase in dosage the average rat weight started to fall but in a few days was rising again, indicating a gradually developed tolerance. The food consumption of this group fell from 11 gm. per day to 8 gm. at the fortieth day and then rose again slightly. The second group (A–2) received the same dosages of atabrine plus riboflavin at a level of 5 mg. for 5 weeks and then 10 mg. per kg. for the remaining 3 weeks. The growth and food consumption curves for groups A–1 and A–2

[1] From the Divisions of Chemotherapy and Pathology, National Institute of Health.

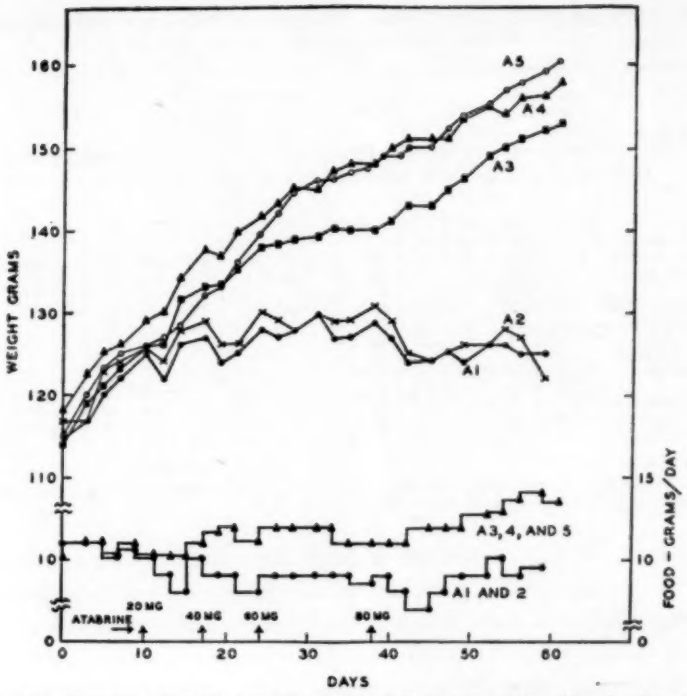

FIGURE 1.—The effect of atabrine on the growth and food consumption of female white rats.

were identical, indicating that supplements of riboflavin had no effect on the toxic action of the atabrine. Group A–4 received water by stomach tube daily and group A–5 was not treated in any way. There was no difference in the growth of food consumption of these two groups. Group A–3 received riboflavin at a level of 5 mg. per kg. for 5 weeks and 10 mg. for the last 3 weeks. The growth and food consumption did not differ significantly from groups A–4 and A–5. When animals from the three latter groups were killed, no gross or microscopic lesions were found.

No significant differences were seen between the two groups (A–1 and A–2, table 1) receiving atabrine. Gross post-mortem examination of the 18 rats which survived to the end of the feeding period showed a general yellow discoloration of the skin and viscera, especially the lower portion of the small intestine and the corticomedullary zone of the kidneys. But the most striking feature was the presence in 13 of the 18 rats of multiple large, pale yellow infarcts of the liver, sometimes involving over half the liver substance. Accompanying these infarcts there were usually more or less extensive, chiefly fibrinous adhesions of the omentum, diaphragm, and body wall.

Histologic alterations were much more widespread and damaging than could be suspected from the gross picture.

TABLE 1.—*Average grade of involvement by organs in rats given atabrine and sulfadiazine severally and in combination*

Number	Organ	Atabrine 60+ mg. per kg.		Atabrine 30 mg. per kg.				Atabrine 30 mg. and sulfadiazine 300 mg. per kg.				Sulfadiazine 300 mg. per kg.				Control
		A-1	A-2	B-1	B-2	B-3	B-4	B-9	B-10	B-11	B-12	B-5	B-6	B-7	B-8	B-13
1	Heart	1.20	1.04	0.30	0.37	0.11	0.05	0.65	0.55	0.52	0.27	0.02	0.04	0.13	0.02	0.04
2	Skeletal muscle	0.90	1.34	0.27	0.25	0.0	0.10	0.57	0.71	0.12	0.30	0.11	0.0	0.0	0.02	0.02
3	Lung interstitial	0.60	0.75	0.56	0.45	0.38	0.40	0.90	0.67	0.50	0.45	0.0	0.0	0.0	0.0	0.05
4	Lung alveolar	1.65	1.25	0.25	0.30	0.18	0.25	0.38	0.44	0.20	0.25	0.0	0.02	0.0	0.0	0.0
5	Liver	3.00	3.62	0.12	0.0	0.0	0.0	0.0	0.0	0.15	0.0	0.0	0.0	0.0	0.0	0.0
6	Kidney glomeruli	1.00	1.19	1.00	0.70	0.45	0.72	0.95	0.86	0.75	0.70	0.05	0.0	0.0	0.0	0.07
7	Kidney tubules	1.52	1.31	1.62	1.50	1.50	1.57	1.50	1.64	1.85	1.35	0.0	0.0	0.0	0.0	0.0
8	Ileum	1.40	1.34	0.0	0.30	0.60	0.65	1.60	0.88	1.61	0.90	0.0	0.0	0.0	0.0	0.0
9	Common mesenteric nodes	1.37	1.44	0.06	0.22	0.11	0.0	1.33	1.31	0.61	0.33	0.0	0.0	0.0	0.0	0.0
10	Spleen	0.40	0.37	0.12	0.0	0.0	0.20	0.35	0.33	0.0	0.0	0.0	0.0	0.05	0.0	0.0
Average of items 1-10		1.31	1.37	0.43	0.41	0.33	0.39	0.82	0.74	0.63	0.45	0.02	0.01	0.02	0.0	0.02
11	Splenic myelosis	1.10	1.09	1.30	0.75	0.69	0.47	0.77	0.43	0.37	0.37	0.69	0.60	0.26	0.60	0.95
12	Hemosiderosis	1.17	1.37	0.57	0.37	0.25	0.32	0.80	0.28	0.35	0.32	0.37	0.27	0.15	0.03	0.24

0.2=trace; 0.5=slight; 1=moderate; 2=marked; 3=extreme. These were the grades used on the individual organs from which the above averages were derived.

The heart usually presented a focal myocarditis largely restricted to the wall of the left ventricle and the interventricular septum. In some animals there were small foci of coagulation necrosis of muscle fibers, in others only isolated oxyphil necrotic fibers. Accompanying or following this fiber necrosis, there appeared an interstitial proliferation of small fibroblasts, enmeshing surviving or necrotic muscle fibers or replacing them entirely. Often slight lymphocyte infiltration accompanied the proliferative process. Occasionally necrotic foci reached 500μ in diameter, but more often comprised only a few fibers. Frequently only isolated coagulated muscle cells were seen.

In addition to these focal lesions, there was sometimes an irregular basophilic reticulation or stippling of muscle fibers throughout or in diffuse patches. Valves were normal.

The lungs presented more or less extensive filling of the alveoli by large round cells with a small round leptochromatic nucleus. Alveoli were often so closely packed that these cells became coherent and polygonal in outline. The cell borders were then distinctly eosinophilic. The exudate cells were commonly mononuclear but sometimes contained two, three, or even five nuclei. Usually the septa were thin, but sometimes they were more or less infiltrated by similar monocytoid cells. This interstitial infiltration was more prominent in areas and in cases where the alveolar exudation was less pronounced.

In addition to this mononuclear cell pneumonia, small vessels often presented a deeply basophilic reticulation of the more or less swollen endothelial cells and of the smooth muscle cells of arterioles. The striated muscle of the pulmonary veins usually lacked this basophilia.

In the liver there were frequent collections of large cells, more often around hepatic venules than elsewhere. Their nuclei were small and leptochromatic. Their cytoplasm was broad and finely granular or reticular. The granules and reticulum were a fairly deep blue-green with eosin-azure, faintly fuchsinophilic and iron-negative with the acid ferrocyanide fuchsin sequence, and negative for fats with Sudan brown or Sudan IV.

The liver infarcts were coagulative in type, showing necrotic cell cords, thrombosed capillaries and marginal infiltration by numerous polymorphonuclear leucocytes, fat-laden macrophages, or both. Sometimes cell cord structure within the infarct was not recognizable and definite fibroblastic granulation tissue proliferation was seen marginally. Arteries and hepatic and portal veins within infarcts were often intact and surrounded by a narrow rim of surviving tissue, but some showed necrosis and thrombosis. Portal areas adjacent to infarcts showed variable grades of fibroblast proliferation and fatty macrophage, leucocyte, and lymphocyte infiltration. The portal veins near the margins of infarcts often showed mural or occluding thrombi of fibrin with or without organization by ingrowing fusiform fibroblasts.

In the kidneys, the epithelium of the glomerular tufts and capsules was often greatly swollen. The cytoplasm of the swollen cells was filled with a fine deep blue reticulum (with eosin-azure), and the glomerular capillaries were compressed and anemic. The glomeruli were fat-free and iron-negative with appropriate special methods. In the corticomedullary zone the clear cytoplasm of the straight tubules contained many fine to fairly coarse, deep blue violet (eosin-azure) granules, often disposed to form a cytoplasmic network. These granules were red with basic fuchsin, gray with iron hematoxylin van Gieson, and iron-negative. These tubules were usually fat-free, but sometimes there was a moderate accompanying fine fat droplet accumulation in the epithelium or in the stroma. Sometimes the basophilic stippling of the epithelium extended to the collecting tubules of the pyramid.

The villi of the midportion of the ileum, often also the jejunum, were swollen and distended by large mononuclear cells. These cells showed small leptochromatic nuclei and broad, finely granular or finely reticular cytoplasm staining blue-green with eosin-azure. Similar cells were often present in the interglandular stroma of the mucosa in the same levels. Clusters of similar blue-green cells were seen in intestinal lymphoid follicles.

Cells of the same type often formed prominent clumps in the pulp of the common mesenteric lymph nodes, especially the ileocecal node. Where closely packed in lymph node pulp, these cells tended to assume polygonal outlines. Some showed a little finely granular Prussian

blue between pale brown granules when the acid ferrocyanide reaction was applied.

A few similar pigmented mononuclear cells were sometimes seen in splenic follicles. The amount of myelosis in the spleen pulp was not materially different from that in control rats. On the average there was moderate pulp hemosiderosis. In some animals the follicular arterioles presented swelling and fine, deeply basophilic reticulation of smooth muscle fibers and endothelium, just as was seen in some of the pulmonary arterioles.

In some of the thigh and leg muscles, there was an irregularly distributed myositis. In this there were irregular interstitial fibroblast proliferation and a muscle fiber necrosis which was usually small in amount and was present in perhaps one-third of the animals. Fiber atrophy and nuclear multiplication occurred in isolated fibers; others were hyaline and waxy in appearance. Multinuclear muscle giant cells were occasionally seen. Interstitial lymphocyte infiltration in affected areas was infrequent. Usually some of the muscles were normal.

Diaphragm and omentum were studied only in those cases in which they were adherent to liver infarcts. In these they showed more or less pronounced interstitial exudation of neutrophil leucocytes, macrophages, and lymphoid cells and proliferation of fibroblasts, just as in the other borders of the infarcts.

In addition to the foregoing, the tibia and femur with knee joint, the adrenal, the esophagus, stomach, duodenum, colon, rectum, pancreas, and mediastinal contents were regularly studied. No significant changes were seen in these structures.

The foregoing changes were those observed with doses of atabrine approaching the limits of toleration. Because of the severity of these lesions, it was deemed necessary to determine the effect of lower dosages. Further, because of the probability of concurrent use in man of atabrine and drugs of the sulfa series, other series of rats were given both atabrine and sulfadiazine.

One hundred and thirty male white rats were divided into 13 groups of 10 rats each, having an average weight of 99 gm. ($\pm$0.5 gm.). The first 4 groups (B–1 to B–4, table 1) were given atabrine daily by stomach tube at a dose level of 30 mg./kg. Group B–1 was fed a diet of ground Purina dog chow; group B–2 received the same plus 10 percent ground whole liver; group B–3 received chow plus 10 percent ground kidney; and group B–4 received chow supplemented by 10 percent liver and 10 percent kidney. The 4 groups gained weight at approximately 3.3 gm. per day, there being no significant difference between the groups (fig. 2). The food consumption fell off for about a week after starting the atabrine, but then returned to a level of 16 to 17 gm. per day which was maintained to the end of the experiment.

The diets of groups B–5, B–6, B–7, and B–8 corresponded to groups B–1, B–2, B–3, and B–4, respectively. These groups were given sulfadiazine (300 mg./kg.) instead of atabrine. The group receiving the chow averaged a gain in weight of approximately 3.3 gm. per day for the first 30 days and then stopped sharply; no more weight was gained in the next 20 days (fig. 3). The groups receiving the liver or kidney averaged a gain of 3.8 gm. per day during the first 33 days and then gained only 5 gm. during the next 17 days. The group receiving liver and kidney averaged a gain in weight of 4.5 gm. per day during the first 33 days and then gained less than 10 gm. during the next 17 days. The food consumption of the sulfadiazine groups started at a level of approximately 16 gm. per day, reached a maximum of 19 gm. per day at about the twenty-fifth day, and then fell to 16 gm. per day at the end of the experiment. Light et al. (*1*) found that inclusion of 0.5 percent sulfadiazine in the diet of rats inhibited the growth after a period of a few weeks.

The diets of groups B–9, B–10, B–11, and B–12 were the same as those of groups 1, 2, 3, and 4, respectively. These 4 groups received atabrine, 30 mg./kg., and sulfadiazine 300 mg./kg., daily by stomach tube. Groups B–9 and B–10 maintained a fairly constant growth rate of 3 gm. per day for 25 days, reached a top weight of approximately 185 gm. at 30 days, and then lost weight during the last 15 days (fig. 4). Groups B–11 and B–12 gained at a rate of 3.3 gm. per day for 30 days and then lost weight during the last 10 days. The food consumption of the atabrine-sulfadiazine animals remained constant at 16 gm. per day until the twenty-fifth day when it began to fall and averaged about 11 gm. at 50 days.

Group B–13 was fed a chow diet and received no drugs. These animals gained an average of 3.3 gm. a day throughout the 50-day period (fig. 5). The food consumption of this group started at about 16 gm. a day and increased to 22 gm. at the fiftieth day.

At autopsy the control series and the animals which had received sulfadiazine alone presented no significant gross or histologic lesions. The lesions observed in those receiving both drugs were not materially different from those in rats receiving 30 mg. atabrine per kg. alone. The purely dietary variations made no evident difference in the severity of the lesions in the 30 mg. atabrine series. With both drugs lesions seemed less severe on the average with both liver and kidney supplements, and most severe with neither supplement (table 1).

With this lower (30 mg. per kg.) dosage of atabrine, liver infarcts and portal thrombosis were absent and pigment cell accumulation in the liver was less frequent and less marked. Renal changes were similar to those previously described but were less severe. The pig-

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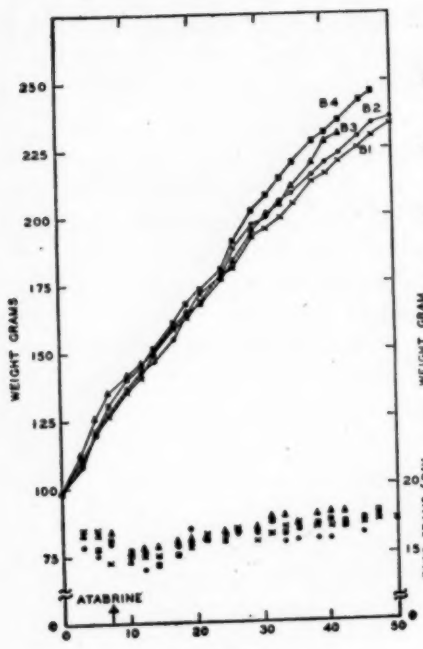
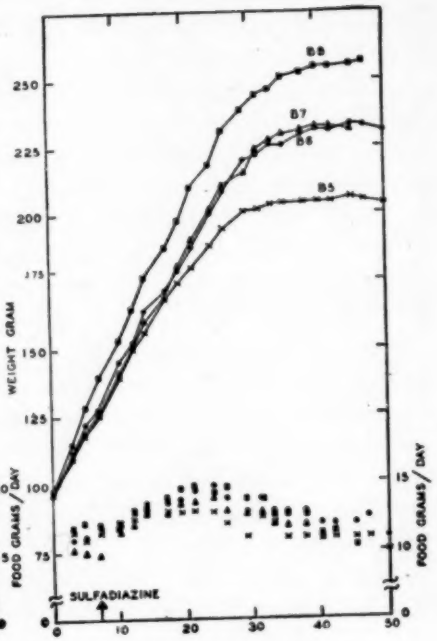


FIGURE 2.



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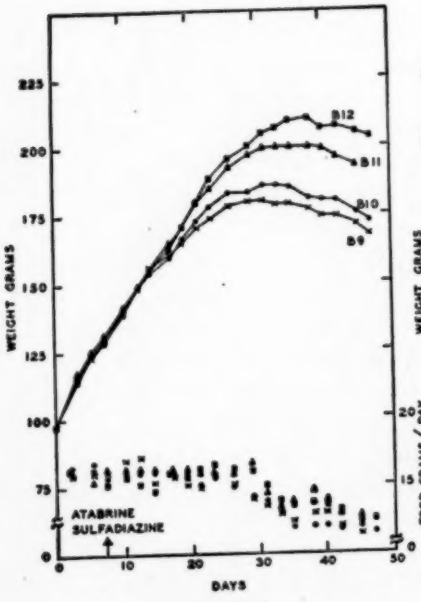

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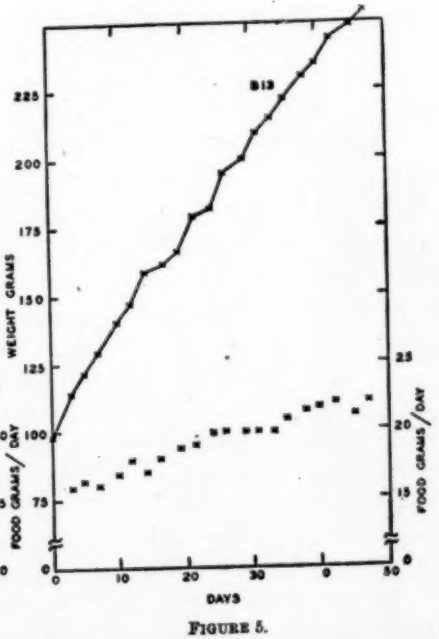

FIGURE 5.

The effect of atabrine and sulfadiazine on the growth and food consumption of male white rats.

ment cell accumulation in the intestinal mucosa was less pronounced and was restricted to one or two of the three levels of the ileum. Pigment cell accumulation in splenic follicles was less frequent and pulp hemosiderosis was relatively slight. Myositis and myocarditis, though often present, were generally less severe, and necrotic muscle fibers were rarely found. In the lungs monocytic exudation was less pronounced and predominantly interstitial rather than intra-alveolar. In table 1 the average grade of involvement for these 13 groups, B–1 to B–13, is compared with that in the first 2 groups, A–1 and A–2, given the very high atabrine dosage.

DISCUSSION

It should be noted that the foregoing pathologic picture was produced only by a very high dosage of atabrine continued over a long period. It is perhaps suggestive that a number of writers have recorded electrocardiographic changes following the use of atabrine both in man and in experimental animals. However, toxic reactions in man are rare; Bispham (*2*) recorded only 38 in nearly 50,000 cases. We have found no record of an autopsy on any person whose death was attributable to atabrine. The only two papers which give any pathology of experimental animals are those of Hecht (*3*) and of Martin, Cominole, and Clark (*4*).

In the course of primarily pharmacologic studies, Hecht noted only yellow staining of the upper small intestine in fatally (acutely) intoxicated rabbits. In cats he noted a well marked enteritis with relaxed hyperemic gut after oral administration; after subcutaneous injection, liver hyperemia and fat deposition in the convoluted tubules (Hauptstücken). (Professor Domagk). This last finding is of little significance as in cats these tubules are usually heavily laden with fat. With chronic intoxication in rabbits and cats, Hecht reported that yellow coloration of skin and mucosae appeared in a few days. He noted that, as measured by its greenish yellow fluorescence in ultraviolet light, much atabrine was present in the site of injection in mice, in the liver, gall bladder, and intestine and, later (24 hours), in the thymus. Little was present in the kidney.

Martin, Cominole, and Clark fed daily doses of atabrine dihydrochloride in warm water by stomach tube to rabbits, cats, and dogs. Dosage varied from 10 to 200 mg. per kg. Treatment continued for 4 days to 7 weeks or until the animals were near death. Killed animals showed emaciation, dehydration, yellow staining of digestive and urinary mucosae and less in liver, pancreas, spleen, and kidney, and still less in other viscera (absent with lower dosage). Only dog tissues were examined microscopically. At 200 mg. dosage (4 doses), there were passive congestion of liver, kidney, spleen, and gastrointestinal mucosa and mild parenchymatous degeneration of liver. There

were no changes in renal glomeruli or tubules. Spleen pulp was relatively anemic, though sinuses were engorged. Moderate to marked mucus secretion of bronchial, gastric, duodenal, and colonic glands was noted. Heart, pancreas, and adrenal were normal. Brown pigment was seen in Kupffer cells of liver on 100–50 mg. dosage and liver cells in centers and midzones of lobules appeared swollen. No necrosis was seen. At 100 mg. dosage (15–27 doses), hyaline casts were seen in renal tubules. Spleen pulp showed many monocytes with granular brown pigment. At 10 mg. dosage the only finding was the "hemosiderin-like" pigment in liver and spleen. The iron content of this pigment was not given.

SUMMARY

Extremely heavy dosage of atabrine produces an arrest of growth and lowered food consumption in rats which is not prevented by riboflavin. At autopsy such rats present pigment cell infiltration of the intestinal mucosa, lymph nodes, spleen, and liver, an interstitial and exudative monocytic pneumonia, a focal myocarditis and myositis, and often portal thrombi and hepatic infarcts. A moderate splenic hemosiderosis and a heavy nonferrous pigmentation of the epithelium of renal glomeruli and medullary tubules are also present. With lesser, but still heavy dosage of 30 mg. per kg. the growth arrest almost vanishes and the lesions are much diminished. Sulfadiazine, alone or in combination with atabrine, produces a late growth arrest but gives little evident gross or microscopic pathologic alteration.

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SICKNESS ABSENTEEISM AMONG MALE AND FEMALE INDUSTRIAL WORKERS, 1933–42, INCLUSIVE [1]

By W. M. Gafafer, *Senior Statistician, United States Public Health Service*

The quarterly reports for the year 1942 on the frequency of sickness and nonindustrial injuries causing disability for 8 consecutive calendar days or longer among a group of over 250,000 male members

[1] From the Division of Industrial Hygiene, National Institute of Health.

of industrial sick benefit organizations have appeared (*1–4*), the organizations including sick benefit associations, group insurance plans, and company relief departments. The present report records the experience among males and females for the years 1933–42. The last report of the series referring to the experience among females appeared in 1942 (*1*).

Tables 1 and 2 show for males and females, respectively, the variation of the frequency rates according to cause during the 10-year period 1933–42. Attention is directed to the excesses shown for each year by the female rates for all causes and for each broad sickness group when compared with the corresponding rates for the males. The male rate of 106.1 for 1942 for all causes is the highest recorded annual rate since 1933 and is 16 percent greater than the

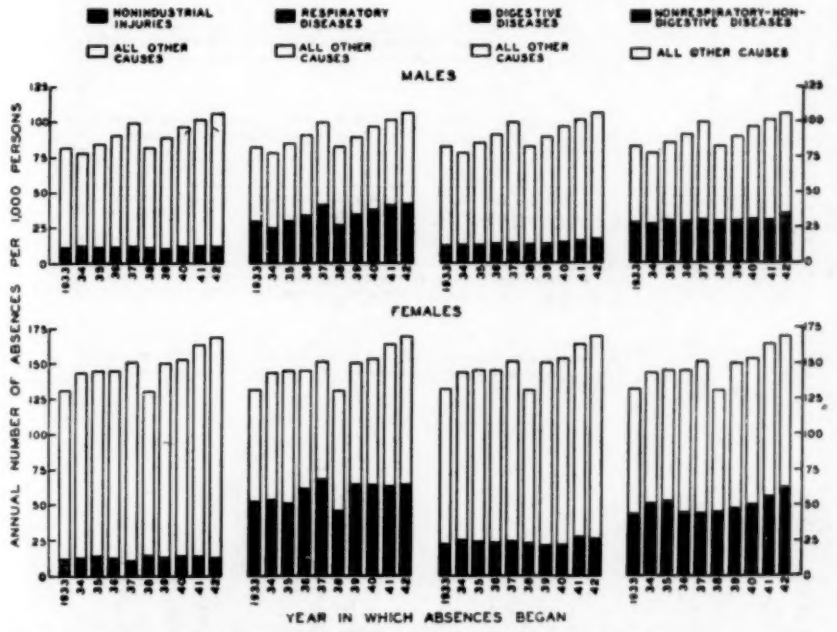

FIGURE 1.—Average annual number of absences per 1,000 persons on account of sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer, by broad cause group and year in which absences began, experience of MALE and FEMALE employees in various industries, 1933–42, inclusive. (Each bar for a particular year represents the average annual frequency from all causes and the contribution made to that frequency by a particular cause group.)

10-year average of 91.1. The female rate of 168.4 for 1942 for all causes is also the highest recorded annual rate since 1933, being almost 60 percent greater than the corresponding male rate and 14 percent in excess of the 10-year average of 148.1. For the males each broad sickness group for 1942 shows a rate that has never been equalled or exceeded since 1933, while for the females only the nonrespiratory-nondigestive group is so characterized.

TABLE 1.—*Average annual number of absences per 1,000 males on account of sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer, by cause and year in which absences began, experience of* MALE *employees in various industries, 1933–42, inclusive*[1]

Cause. (Numbers in parentheses are disease title numbers from the International List of Causes of Death, 1939)	Annual number of absences per 1,000 males										
	Year in which absences began										
	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1933–42[2]
Sickness and nonindustrial injuries	82.3	78.1	85.1	90.7	99.5	82.3	89.0	96.4	101.3	106.1	91.1
Percent of female rate	*65*	*64*	*59*	*63*	*66*	*65*	*59*	*63*	*62*	*63*	*62*
Nonindustrial injuries	11.3	12.3	11.2	11.5	11.8	11.1	10.3	11.8	12.0	11.7	11.5
Sickness	71.0	65.8	73.9	79.2	87.7	71.2	78.7	84.6	89.3	94.4	79.6
Respiratory diseases	28.6	24.5	29.3	33.5	40.9	26.4	33.9	37.7	40.8	41.4	33.7
Tuberculosis of the respiratory system (13)	.8	.8	1.0	.8	.8	.9	.7	.7	.7	.8	.8
Influenza and grippe (33)	15.3	10.1	12.7	15.2	21.4	9.9	16.6	17.5	18.9	15.7	15.3
Bronchitis, acute and chronic (106)	2.9	3.2	3.6	4.8	4.7	4.2	4.1	5.2	5.6	6.5	4.5
Pneumonia, all forms (107–109)	1.8	2.0	2.3	2.6	3.0	2.2	3.0	3.6	3.7	5.5	3.0
Diseases of pharynx and tonsils (115b, 115c)	3.9	4.3	5.1	4.8	5.4	4.5	4.4	4.9	5.5	5.4	4.8
Other respiratory diseases (104, 105, 110–114)	3.9	4.1	4.6	5.3	5.6	4.7	5.1	5.8	6.4	7.5	5.3
Digestive diseases	12.1	12.7	12.9	13.6	13.8	13.4	13.4	14.4	15.4	16.4	13.8
Diseases of stomach except cancer (117, 118)	3.3	3.2	3.6	3.7	4.0	4.1	3.5	3.9	4.2	4.7	3.8
Diarrhea and enteritis (120)	1.0	1.3	1.1	1.3	1.4	.9	1.2	1.4	1.5	1.8	1.3
Appendicitis (121)	3.3	3.9	4.0	4.1	4.4	3.9	4.3	5.0	5.3	5.0	4.3
Hernia (122a)	1.3	1.5	1.4	1.7	1.5	1.7	1.5	1.5	1.5	1.9	1.6
Other digestive diseases (115a, 115d, 116, 122b–120)	3.2	2.8	2.8	2.8	2.5	2.8	2.9	2.6	2.9	3.0	2.8
Nonrespiratory-nondigestive diseases	28.3	27.1	29.7	29.3	30.0	29.4	29.4	30.4	30.2	34.4	29.8
Infectious and parasitic diseases (1–12, 14–24, 26–29, 31, 32, 34–44)[3]	2.0	2.5	3.0	2.3	2.7	2.1	2.1	1.8	2.5	2.5	2.4
Cancer, all sites (45–55)	.5	.4	.5	.4	.4	.6	.6	.6	.5	.4	.5
Rheumatism, acute and chronic (58, 59)	4.9	4.0	4.0	4.2	4.1	3.7	3.5	4.0	3.7	3.9	4.0
Neurasthenia and the like (part of 84d)	.8	.8	1.2	1.1	1.1	1.0	.9	1.1	1.0	1.1	1.0
Neuralgia, neuritis, sciatica (87b)	2.1	1.8	2.3	2.2	2.2	2.1	2.2	2.3	2.0	2.2	2.2
Other diseases of nervous system (80–85, 87 except part of 84d, and 87b)	1.4	1.4	1.3	1.1	1.0	1.2	1.1	1.0	1.3	1.2	1.2
Diseases of the heart (90–95)	2.1	2.0	2.4	2.3	2.5	2.6	2.9	2.9	2.5	2.7	2.5
Other diseases of the circulatory system (96–103)	2.7	2.5	2.8	3.1	3.0	3.3	3.5	3.7	3.6	4.3	3.2
Nephritis, acute and chronic (130–132)	.5	.5	.5	.4	.5	.5	.4	.4	.4	.4	.5
Other diseases of the genitourinary system (133–138)	2.2	2.4	2.7	2.3	2.3	2.4	2.3	2.7	2.4	2.6	2.4
Diseases of the skin (151–153)	2.7	2.5	2.7	3.0	3.1	3.0	2.7	2.8	2.7	3.1	2.8
Diseases of organs of movement except diseases of joints (156b)	2.8	2.7	2.7	3.2	2.9	2.8	2.6	2.8	2.8	3.0	2.8
All other diseases (56, 57, 60–79, 88, 89, 154, 155, 156a, 157, 162)	3.6	3.6	3.6	3.7	4.2	4.1	4.6	4.3	4.8	7.0	4.3
Ill-defined and unknown causes (200)	2.0	1.5	2.0	2.8	3.0	2.0	2.0	2.1	2.9	2.2	2.3
Average number of persons	152,203	174,643	157,959	170,680	200,967	178,405	188,595	216,621	257,726	287,548	1,985,347

[1] Industrial injuries and venereal diseases are not included.
[2] Average of the 10 annual rates.
[3] Exclusive of influenza and grippe, respiratory tuberculosis, and venereal diseases.

TABLE 2.—*Average annual number of absences per 1,000 females on account of sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer, by cause and year in which absences began, experience of* FEMALE *employees in various industries, 1933–42, inclusive* [1]

Cause. (Numbers in parentheses are disease title numbers from the International List of Causes of Death, 1939)	Annual number of absences per 1,000 females										
	Year in which absences began										
	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1933–42 [2]
Sickness and nonindustrial injuries	131.3	143.6	144.9	144.9	151.1	130.4	150.0	153.3	163.3	168.4	148.1
Percent of male rate	*160*	*184*	*170*	*160*	*152*	*158*	*169*	*189*	*161*	*159*	*163*
Nonindustrial injuries	11.8	12.5	14.2	12.5	10.9	14.5	13.0	14.0	13.9	12.8	13.0
Sickness	119.5	131.1	130.7	132.4	140.2	115.9	137.0	139.3	149.4	155.6	135.1
Respiratory diseases	51.3	52.9	50.4	61.0	67.8	45.3	63.9	63.5	63.1	63.9	58.3
Tuberculosis of the respiratory system (13)	1.0	1.4	.7	.8	.6	.7	.9	.6	.7	.6	.8
Influenza and grippe (33)	28.1	22.9	22.5	27.7	33.9	16.1	29.9	27.7	28.0	19.0	25.6
Bronchitis, acute and chronic (106)	5.8	6.9	6.3	8.4	7.6	6.7	7.3	8.2	7.1	8.3	7.3
Pneumonia, all forms (107–109)	1.2	1.7	1.1	1.3	1.1	2.1	2.0	1.8	.7	2.9	1.6
Diseases of pharynx and tonsils (115b, 115c)	8.1	12.6	13.0	12.8	13.7	10.5	11.6	12.7	12.0	13.4	12.0
Other respiratory diseases (104, 105, 110–114)	7.1	7.4	6.8	10.0	10.9	9.2	12.2	12.5	14.6	19.7	11.0
Digestive diseases	21.7	24.1	23.5	22.9	23.7	22.4	21.5	21.7	26.9	25.5	23.4
Diseases of stomach except cancer (117, 118)	3.4	3.3	3.0	2.8	2.2	2.7	2.2	1.2	2.7	2.4	2.6
Diarrhea and enteritis (120)	2.1	2.6	3.4	2.2	2.4	2.3	1.6	2.4	2.9	3.1	2.5
Appendicitis (121)	8.6	10.6	10.2	12.0	13.8	10.4	11.9	12.1	15.6	13.5	11.9
Hernia (122a)	.1	.5	.5	.4	.4	.5	.5	.3	.2	.4	.4
Other digestive diseases (115a, 115d, 116, 122b–129)	7.5	7.1	6.4	5.5	4.9	6.5	5.3	5.7	5.5	6.1	6.0
Nonrespiratory-nondigestive diseases	43.2	50.7	51.8	44.0	43.8	44.2	46.9	50.1	54.9	62.0	49.2
Infectious and parasitic diseases (1–12, 14–24, 26–29, 31, 32, 34–44) [3]	2.9	3.7	5.4	2.9	3.1	3.6	2.3	2.6	4.1	4.8	3.5
Cancer, all sites (45–55)	.4	.7	.2	.3	.3	.6	.5	.5	.3	.5	.4
Rheumatism, acute and chronic (58, 59)	3.5	3.4	3.4	3.3	2.9	3.6	2.4	3.1	3.3	3.1	3.2
Neurasthenia and the like (part of 84d)	5.1	5.6	6.7	6.5	5.4	5.5	5.7	5.4	6.2	8.6	6.1
Neuralgia, neuritis, sciatica (87b)	2.3	2.9	2.7	2.0	2.4	1.2	2.1	2.6	2.5	2.8	2.4
Other diseases of nervous system (80–85, 87, except part of 84d, and 87b)	1.2	2.1	.7	.5	1.0	.6	1.2	1.5	1.3	1.1	1.1
Diseases of the heart (90–95)	2.0	2.2	1.7	1.1	1.3	1.4	1.8	1.7	1.8	1.4	1.6
Other diseases of the circulatory system (96–103)	2.1	2.7	2.8	2.3	3.5	3.7	3.2	3.6	4.7	4.6	3.3
Nephritis, acute and chronic (130–132)	.6	.1	.5	.3	.2	.3	.5	.6	.5	0	.4
Other diseases of the genitourinary system (133–139)	9.9	11.1	11.5	8.9	9.3	8.9	9.5	10.2	10.6	11.6	10.2
Diseases of the skin (151–153)	2.9	4.1	3.4	3.1	3.3	2.3	3.3	3.4	3.9	4.6	3.4
Diseases of organs of movement except diseases of joints (156b)	1.3	1.7	2.5	1.7	1.3	1.5	1.4	2.2	2.4	3.7	2.0
All other diseases (56, 57, 60–79, 88, 89, 154, 155, 156a, 157, 162)	9.0	10.4	10.3	11.1	9.8	11.0	13.0	12.7	13.3	15.2	11.6
Ill-defined and unknown causes (200)	3.3	3.4	5.0	4.5	4.9	4.0	4.7	4.0	4.5	4.2	4.2
Average number of persons	14,587	15,644	15,049	15,181	16,921	15,203	15,343	16,318	18,008	18,835	161,089

[1] Industrial injuries and venereal diseases are not included.
[2] Average of the 10 annual rates.
[3] Exclusive of influenza and grippe, respiratory tuberculosis, and venereal diseases.

There are certain specific causes for the males which show for 1942 the highest rates for the 10-year period and at the same time yield relatively high excesses when compared with the corresponding averages for 1933–42. These causes with their excesses are pneumonia, 83 percent; bronchitis, 44 percent; and diarrhea and enteritis, 38 percent. The corresponding causes for the females are diseases of the organs of locomotion except diseases of the joints, 85 percent; pneumonia, 81 percent; and neurasthenia, 41 percent.

The contribution made by each broad cause group to the frequency for all causes is of considerable interest. This contribution is shown graphically in figure 1 for each of the 10 years and for each sex.

The figure shows clearly for each sex that the frequency for all causes rose since 1938, the almost constant rate of increase being evident in the instance of the males. Most striking from year to year is the variation of the male rates for the respiratory diseases, the variation of these rates being definitely reflected in the rates for all causes. For the females, on the other hand, this positive correlation between the variation of the rates for one cause group and that for all causes is not shown by the respiratory group but rather by the nonrespiratory-nondigestive group of diseases particularly since 1938; it is noteworthy that the principal causes determining the movement of the nonrespiratory-nondigestive diseases during the 10-year period are "other diseases of the genitourinary system" and neurasthenia.

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(2) ————: Disabling morbidity among industrial workers, second quarter of 1942. Pub. Health Rep., **57**: 1620–1622 (Oct. 23, 1942).
(3) ————: Disabling morbidity among industrial workers, third quarter of of 1942, with a note on the occurrence of the respiratory diseases, 1933–42. Pub. Health Rep., **58**: 232–234 (Feb. 5, 1943).
(4) ————: Sickness absenteeism among industrial workers, final quarter of 1942, with a note on the occurrence of bronchitis and pneumonia, 1933–42. Pub. Health Rep., **58**: 677–679 (Apr. 23, 1943).

DEATHS DURING WEEK ENDED JULY 31, 1943

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended July 31, 1943	Corresponding week, 1942
Data from 90 large cities of the United States:		
Total deaths	8,305	7,478
Average for 3 prior years	8,289	
Total deaths, first 30 weeks of year	284,120	258,770
Deaths under 1 year of age	705	571
Average for 3 prior years	573	
Deaths under 1 year of age, first 30 weeks of year	19,970	16,984
Data from industrial insurance companies:		
Policies in force	65,668,828	64,944,397
Number of death claims	11,594	10,665
Death claims per 1,000 policies in force, annual rate	9.2	8.6
Death claims per 1,000 policies, first 30 weeks of year, annual rate	10.2	9.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED AUGUST 7, 1943

Summary

For the current week a total of 450 cases of poliomyelitis was reported, as compared with 361 for the preceding week and a 5-year (1938–42) median of 197. Increases occurred in 23 States. The largest numbers of cases, aggregating 359, or 80 percent of the total, were reported in 8 States, 7 of which accounted for most of the increase, as follows (last week's figures in parentheses): California, 111 (104); Texas, 62 (105); Oklahoma, 52 (30); Kansas, 43 (30); Illinois, 34 (6); Connecticut, 24 (7); New York, 18 (10); and Colorado, 15 (0). No other State reported more than 8 cases. The accumulated total for the first 31 weeks of the year is 2,776, as compared with a corresponding 5-year median of 1,403 and with 1,852 in 1941, the largest number for the corresponding period in the past 5 years.

A total of 201 cases of meningococcus meningitis was reported, as compared with 203 last week and a 5-year median of 33. States reporting the largest numbers (last week's figures in parentheses) are as follows: New York, 27 (36); California, 24 (9); Pennsylvania, 19 (16); Illinois, 18 (14); Massachusetts, 12 (10). No other State reported more than 9 cases. The cumulative total for the first 31 weeks of the year is 13,183, as compared with 2,307 for the same period last year, and a 5-year median of 1,359.

Of a total of 232 cases of typhoid fever, as compared with 237 last week and 379 for the 5-year median, 22 occurred in Ohio (9 in Toledo, in which city 56 cases were reported for the 4-week period ended July 31). The cumulative total for the country as a whole for the first 31 weeks of the year is 2,893, as compared with 3,595 for the same period last year and a 5-year median of 4,208.

Deaths registered for the week in 89 large cities of the United States totaled 8,149, as compared with 8,292 last week and a 3-year (1940–42) average of 7,404. The accumulated total for the first 31 weeks of the year is 291,784, as compared with 265,640 for the corresponding period of 1942.

For the first half of 1943 the provisional death rate for the United States is 11.0 per 1,000 population, as compared with 10.6 for the same period last year, and the provisional birth rate is 21.7 as compared with 19.1 last year.

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(1255)

Telegraphic morbidity reports from State health officers for the week ended Aug. 7, 1943, and comparison with corresponding week of 1942, and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Aug. 7, 1943	Aug. 8, 1942		Aug. 7, 1943	Aug. 8, 1942		Aug. 7, 1943	Aug. 8, 1942		Aug. 7, 1943	Aug. 8, 1942	
NEW ENGLAND												
Maine	0	0	0	----	----	----	37	27	27	1	2	0
New Hampshire	0	0	0	----	----	----	3	10	3	1	0	0
Vermont	0	0	0	----	----	----	17	32	14	0	0	0
Massachusetts	2	5	2	----	----	----	114	91	125	12	8	1
Rhode Island	0	1	1	----	----	----	62	11	11	1	0	0
Connecticut	0	0	0	1	2	1	40	18	18	3	0	0
MIDDLE ATLANTIC												
New York	5	6	15	[1] 2	----	[1] 1	401	176	234	27	16	6
New Jersey	1	1	3	5	----	1	166	49	49	7	2	0
Pennsylvania	7	5	6	----	----	----	55	39	117	19	4	3
EAST NORTH CENTRAL												
Ohio	1	8	6	3	8	3	135	46	46	2	0	0
Indiana	3	3	5	8	----	----	21	7	7	3	0	0
Illinois	7	11	12	7	4	3	129	19	25	18	2	2
Michigan [2]	1	3	5	----	10	4	162	37	122	9	2	2
Wisconsin	4	1	1	----	20	10	239	109	175	5	0	0
WEST NORTH CENTRAL												
Minnesota	2	0	1	----	1	----	32	13	15	0	0	0
Iowa	4	10	1	----	----	----	16	20	25	2	0	0
Missouri	2	4	4	----	7	2	11	8	8	5	3	0
North Dakota	0	0	1	4	----	1	32	2	2	3	0	0
South Dakota	1	0	1	----	----	----	12	12	1	0	2	0
Nebraska	1	0	0	----	3	----	6	3	3	0	0	0
Kansas	2	0	2	1	----	1	15	30	15	3	0	1
SOUTH ATLANTIC												
Delaware	0	3	0	----	----	----	4	0	0	0	0	0
Maryland [2]	3	5	1	2	1	1	31	70	13	4	4	1
District of Columbia	1	2	2	----	1	----	22	2	5	0	1	0
Virginia	7	7	15	75	33	16	48	11	43	7	1	1
West Virginia	2	5	3	----	----	2	9	4	6	1	1	1
North Carolina	9	11	11	3	----	----	11	9	26	3	0	1
South Carolina	4	3	3	207	70	67	21	11	11	2	2	1
Georgia	12	9	9	9	5	5	13	6	11	3	0	0
Florida	3	3	3	4	4	1	3	6	6	2	0	0
EAST SOUTH CENTRAL												
Kentucky	0	7	5	1	----	1	5	5	5	6	0	2
Tennessee	1	3	3	1	2	6	6	9	9	4	2	1
Alabama	12	4	9	17	9	9	7	10	12	3	0	1
Mississippi [2]	1	3	4	----	----	----	----	----	----	1	2	1
WEST SOUTH CENTRAL												
Arkansas	4	5	5	3	3	5	9	7	7	0	1	0
Louisiana	0	3	3	1	3	3	1	5	3	1	0	0
Oklahoma	2	2	2	2	15	9	5	4	4	1	1	0
Texas	18	19	21	190	79	79	54	29	34	5	1	1
MOUNTAIN												
Montana	1	0	0	----	----	----	28	19	17	1	0	0
Idaho	0	1	1	----	----	----	21	46	4	0	0	0
Wyoming	0	0	1	2	5	----	5	13	3	1	0	0
Colorado	1	0	8	7	11	7	13	17	13	0	0	0
New Mexico	1	0	0	----	----	----	4	4	4	0	0	0
Arizona	1	0	1	28	14	14	6	23	13	1	0	0
Utah [2]	0	0	0	----	----	----	22	49	19	0	0	0
Nevada	0	0	----	----	2	----	11	16	----	0	0	----
PACIFIC												
Washington	7	4	1	----	----	----	15	157	11	9	0	0
Oregon	2	2	1	----	2	3	21	21	15	1	2	0
California	10	10	15	22	20	10	151	164	164	24	6	1
Total	145	169	169	605	334	334	2,251	1,476	1,752	201	65	33
31 weeks	6,888	7,084	8,535	80,678	80,025	151,020	533,746	464,760	464,760	13,183	2,307	1,359

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended Aug. 7, 1943, and comparison with corresponding week of 1942, and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [2]		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Aug. 7, 1943	Aug. 8, 1942		Aug. 7, 1943	Aug. 8, 1942		Aug. 7, 1943	Aug. 8, 1942		Aug. 7, 1943	Aug. 8, 1942	
NEW ENGLAND												
Maine	0	1	1	8	8	8	0	0	0	0	1	2
New Hampshire	0	0	0	1	3	1	0	0	0	0	1	0
Vermont	2	0	0	2	3	2	0	0	0	0	0	0
Massachusetts	0	0	1	53	49	31	0	0	0	5	4	3
Rhode Island	6	0	0	3	2	2	0	0	0	1	0	0
Connecticut	24	2	1	11	11	6	0	0	0	1	3	3
MIDDLE ATLANTIC												
New York	18	5	9	79	58	71	0	0	0	9	6	13
New Jersey	1	7	3	7	19	20	0	0	0	3	2	5
Pennsylvania	1	3	3	47	51	51	0	0	0	10	8	14
EAST NORTH CENTRAL												
Ohio	6	9	9	55	49	50	0	0	0	22	8	17
Indiana	1	2	2	11	9	9	0	0	0	1	1	4
Illinois	34	22	7	25	41	46	2	0	2	7	5	20
Michigan [3]	4	7	8	12	32	32	0	0	1	6	3	4
Wisconsin	1	0	0	27	55	38	0	0	0	2	1	1
WEST NORTH CENTRAL												
Minnesota	6	1	2	10	19	19	0	0	1	1	0	0
Iowa	1	0	2	18	11	11	0	0	4	1	3	5
Missouri	7	4	1	14	14	14	0	2	1	17	13	10
North Dakota	0	0	0	0	4	4	0	0	0	1	0	0
South Dakota	1	0	1	6	16	7	0	0	1	1	0	0
Nebraska	3	3	1	6	1	3	0	0	0	1	0	0
Kansas	43	3	3	10	8	15	0	0	0	3	5	5
SOUTH ATLANTIC												
Delaware	0	0	0	2	1	1	0	0	0	0	1	0
Maryland [3]	0	0	1	14	11	9	0	0	0	0	9	9
District of Columbia	0	0	0	4	7	2	0	0	0	0	0	0
Virginia	2	1	2	6	5	9	0	0	0	7	15	15
West Virginia	0	5	1	17	9	9	0	0	0	6	4	5
North Carolina	2	2	2	17	10	10	0	0	0	6	10	13
South Carolina	0	2	2	8	2	2	0	0	0	10	8	14
Georgia	1	1	2	11	10	10	0	0	0	19	6	28
Florida	0	1	1	4	0	2	0	0	0	2	2	4
EAST SOUTH CENTRAL												
Kentucky	8	8	6	11	12	16	0	0	0	16	13	14
Tennessee	0	19	3	9	19	11	0	0	0	6	7	12
Alabama	1	2	1	9	11	13	0	0	0	5	3	11
Mississippi [3]	2	0	1	3	1	6	0	0	0	9	14	13
WEST SOUTH CENTRAL												
Arkansas	4	6	2	6	4	3	0	0	1	4	8	29
Louisiana	4	1	1	1	6	5	0	0	0	6	10	13
Oklahoma	52	0	0	2	19	8	0	0	0	11	8	19
Texas	62	4	4	18	15	14	0	0	0	17	32	37
MOUNTAIN												
Montana	0	0	0	4	3	3	0	0	0	0	1	1
Idaho	0	0	0	33	0	1	0	0	0	0	0	0
Wyoming	0	0	0	9	7	1	0	0	0	1	0	0
Colorado	15	1	1	10	5	8	0	0	0	1	1	1
New Mexico	5	2	1	0	1	3	0	0	0	3	3	5
Arizona	1	1	0	3	2	1	0	0	0	2	2	1
Utah [3]	6	0	0	7	0	3	0	0	0	0	2	2
Nevada	2	0	----	1	0	----	0	0	----	0	0	----
PACIFIC												
Washington	5	0	1	24	8	8	0	0	0	2	0	2
Oregon	8	0	1	7	3	5	0	0	0	2	0	2
California	111	3	8	99	39	40	0	0	0	5	10	10
Total	450	128	197	744	673	705	2	2	34	232	233	379
31 weeks	2,766	1,149	1,403	96,206	87,954	115,033	600	604	1,927	2,893	3,595	4,208

See footnotes at end of table.

WEEKLY REPORTS FROM CITIES

Telegraphic morbidity reports from State health officers for the week ended Aug. 7, 1943, and comparison with corresponding week of 1942, and 5-year median—Con

Division and State	Whooping cough			Week ended Aug. 7, 1943								
	Week ended		Median 1938–42	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	Aug. 7, 1943	Aug. 8, 1942			Amebic	Bacillary	Unspecified					
NEW ENGLAND												
Maine	16	23	23	0	0	0	0	0	0	0	0	0
New Hampshire	2	7	1	0	0	0	0	0	0	0	0	0
Vermont	19	68	35	0	0	0	0	0	0	0	0	0
Massachusetts	53	208	115	0	0	0	0	0	0	0	0	0
Rhode Island	35	15	14	0	0	0	0	0	0	0	0	0
Connecticut	33	56	56	0	0	9	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	249	347	347	0	3	9	0	2	0	2	0	3
New Jersey	149	215	215	0	1	0	0	0	0	0	0	0
Pennsylvania	228	257	436	0	0	0	0	0	0	0	0	0
EAST NORTH CENTRAL												
Ohio	252	260	343	0	0	0	0	0	0	6	0	0
Indiana	42	46	17	0	0	0	0	0	0	0	0	0
Illinois	195	334	328	0	0	1	0	2	0	0	1	0
Michigan [2]	257	177	272	0	0	0	0	0	0	0	0	0
Wisconsin	322	242	225	0	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	110	67	51	0	2	0	1	0	0	0	0	0
Iowa	41	32	32	0	0	0	0	0	0	0	0	0
Missouri	40	11	28	0	0	0	1	0	0	0	2	0
North Dakota	21	11	11	0	0	0	0	2	0	0	0	0
South Dakota	3	0	5	0	0	0	0	0	0	0	0	0
Nebraska	7	6	7	0	0	0	0	0	0	0	0	0
Kansas	59	57	57	0	0	0	0	2	0	0	1	1
SOUTH ATLANTIC												
Delaware	0	2	2	1	0	0	0	0	0	1	0	0
Maryland [2]	108	60	62	0	0	0	6	0	0	2	0	0
District of Columbia	28	24	20	0	0	0	0	0	0	0	0	0
Virginia	72	40	50	0	0	0	315	0	0	5	2	0
West Virginia	84	11	21	0	0	0	0	0	0	0	0	0
North Carolina	199	85	111	0	0	57	0	0	0	4	0	0
South Carolina	115	52	52	0	0	43	0	0	0	0	0	7
Georgia	20	13	26	0	1	16	2	0	0	0	1	32
Florida	11	8	16	0	0	0	1	0	0	0	0	7
EAST SOUTH CENTRAL												
Kentucky	33	101	61	0	0	10	0	0	0	0	0	0
Tennessee	50	27	49	0	0	0	13	1	0	0	3	2
Alabama	35	7	22	0	0	0	0	0	0	1	0	36
Mississippi [2]	----	----	----	0	0	0	0	0	0	0	0	3
WEST SOUTH CENTRAL												
Arkansas	39	8	8	1	7	47	0	0	0	0	2	0
Louisiana	5	2	17	0	1	0	0	0	0	0	0	5
Oklahoma	5	7	18	0	0	0	0	0	0	0	0	0
Texas	245	134	150	0	28	351	0	3	1	0	0	59
MOUNTAIN												
Montana	17	34	29	0	0	0	0	0	0	0	0	0
Idaho	6	7	7	0	0	0	0	0	0	0	0	0
Wyoming	6	4	5	0	0	0	0	0	0	0	0	0
Colorado	72	30	30	0	0	13	0	0	0	0	0	0
New Mexico	0	12	15	0	1	2	4	0	0	0	1	0
Arizona	15	12	16	0	0	0	13	0	0	0	0	0
Utah [2]	84	16	52	0	0	0	0	0	0	0	3	0
Nevada	0	13	----	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	35	64	64	0	0	0	0	0	0	0	0	0
Oregon	44	16	19	0	0	0	0	0	0	0	0	0
California	182	185	186	0	0	10	0	10	0	0	0	0
Total	3,643	3,413	3,698	2	44	568	356	22	1	21	16	155
31 weeks	125,517	116,280	120,862	39	1,269	9,254	3,872	376	18	300	560	1,923
31 weeks, 1942	----	----	----	55	652	4,928	3,745	280	34	346	613	1,506

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever cases reported separately as follows: Massachusetts, 3; Connecticut, 1; New York, 2; New Jersey, 2; Illinois, 1; Michigan, 1; Virginia, 1; South Carolina, 1; Georgia, 7; Louisiana, 1; Texas, 5; California, 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended July 24, 1943

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	6	0	1	0	0	0	0	1
New Hampshire:												
Concord	0	0	------	0	0	0	0	0	0	0	0	0
Vermont:												
Barre	0	0	------	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston	5	0	------	1	32	4	7	0	27	0	2	27
Fall River	0	0	------	0	2	0	0	0	2	0	0	1
Springfield	0	0	------	0	3	0	0	0	1	0	0	1
Worcester	0	0	------	0	2	1	4	0	10	0	0	5
Rhode Island:												
Providence	0	0	1	1	66	2	0	1	7	0	0	41
Connecticut:												
Hartford	0	0	------	0	0	0	1	0	0	0	0	2
New Haven	0	0	------	0	17	0	1	1	0	0	0	6
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	0	4	0	6	0	3	0	0	15
New York	9	0	2	0	318	16	49	5	30	0	3	86
Rochester	0	0	------	0	6	2	5	0	1	0	0	5
Syracuse	0	0	------	0	6	1	2	0	4	0	0	12
New Jersey:												
Camden	0	0	------	1	0	0	0	0	0	0	0	0
Newark	0	0	1	0	31	3	2	1	1	0	0	40
Trenton	0	0	------	0	0	0	2	0	1	0	0	2
Pennsylvania:												
Philadelphia	0	0	------	0	3	8	13	0	11	0	0	95
Pittsburgh	2	0	------	0	7	2	3	0	10	0	2	27
Reading	0	0	------	0	1	0	0	0	1	0	0	5
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	0	1	0	3	2	7	1	3	0	0	11
Cleveland	2	0	1	0	15	2	7	1	17	0	0	44
Columbus	0	0	------	0	23	1	0	0	1	0	0	16
Indiana:												
Fort Wayne	1	0	------	0	3	0	0	0	0	0	1	0
Indianapolis	0	0	------	1	10	0	8	0	2	0	0	22
South Bend	1	0	------	0	1	0	0	0	0	0	0	0
Terre Haute	0	0	------	0	1	0	1	0	0	0	0	0
Illinois:												
Chicago	5	0	------	0	88	5	14	2	12	0	1	83
Springfield	0	0	------	0	1	0	0	0	0	0	0	0
Michigan:												
Detroit	3	0	------	0	85	3	10	1	8	2	5	90
Flint	1	0	------	0	7	0	0	0	3	0	0	5
Grand Rapids	0	0	------	0	41	0	0	0	0	0	0	32
Wisconsin:												
Kenosha	0	0	------	0	0	0	0	0	2	0	0	1
Milwaukee	0	0	------	0	63	0	0	0	16	0	0	53
Racine	0	0	------	0	2	0	0	0	0	0	0	2
Superior	0	0	------	0	24	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	49	0	1	0	1	0	0	3
Minneapolis	0	0	------	0	6	0	3	0	4	0	0	2
St. Paul	0	0	------	0	14	0	7	0	1	0	0	59
Missouri:												
Kansas City	1	0	------	0	6	2	13	2	4	0	0	3
St. Joseph	0	0	------	0	1	0	0	0	1	0	0	0
St. Louis	0	0	------	0	14	8	0	0	0	0	2	17

City reports for week ended July 24, 1943—Continued

	Diphtheria cases	Encephalitis, fectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0	-----	0	6	0	1	0	0	0	0	7
Nebraska:												
Omaha	1	0	-----	0	0	0	2	0	0	0	0	1
Kansas:												
Topeka	0	0	-----	0	4	0	0	0	0	0	0	5
Wichita	0	0	-----	0	3	0	1	2	1	0	0	8
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	-----	0	1	0	0	0	0	0	0	0
Maryland:												
Baltimore	0	1	1	0	40	5	8	1	10	0	1	95
Cumberland	0	0	-----	0	0	0	0	0	0	0	0	0
Frederick	0	0	-----	0	0	0	0	0	0	0	0	0
District of Columbia:												
Washington	0	0	-----	0	34	1	5	0	3	0	0	54
Virginia:												
Lynchburg	0	0	-----	0	2	0	0	0	1	0	0	14
Richmond	1	0	-----	0	5	1	1	0	1	0	0	8
Roanoke	0	0	-----	0	0	0	0	0	0	0	0	5
West Virginia:												
Charleston	0	0	-----	0	0	0	0	0	0	0	1	0
Wheeling	0	0	-----	0	0	0	1	0	0	0	0	11
North Carolina:												
Raleigh	0	0	-----	0	0	0	0	0	0	0	0	0
Winston-Salem	1	0	-----	0	1	0	1	0	0	0	0	31
South Carolina:												
Charleston	0	0	3	0	1	1	2	0	0	0	0	0
Georgia:												
Atlanta	0	0	2	0	0	0	2	1	3	0	0	1
Brunswick	0	0	-----	0	0	0	0	0	0	0	0	0
Savannah	0	0	-----	0	0	0	0	0	0	0	0	0
Florida:												
Tampa	0	0	-----	0	1	0	1	0	0	0	0	0
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	-----	1	2	0	2	0	1	0	0	13
Nashville	0	0	-----	0	1	0	5	0	0	0	0	13
Alabama:												
Birmingham	0	0	-----	1	1	0	4	0	2	0	4	4
Mobile	0	0	-----	0	0	0	2	0	0	0	0	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	-----	0	1	0	0	0	1	0	1	2
Louisiana:												
New Orleans	1	0	5	1	7	0	7	0	1	0	2	6
Shreveport	0	0	-----	0	0	0	5	1	1	0	1	0
Texas:												
Dallas	0	0	-----	0	4	0	3	5	0	0	1	6
Galveston	0	0	-----	0	0	0	1	1	0	0	0	0
Houston	0	0	-----	0	0	0	3	3	3	0	1	3
San Antonio	0	0	-----	0	0	0	7	1	0	0	0	2
MOUNTAIN												
Montana:												
Billings	0	0	-----	0	7	0	0	0	0	0	0	0
Helena	0	0	-----	0	3	0	0	0	0	0	0	0
Missoula	0	0	-----	0	0	0	1	0	0	0	0	0
Idaho:												
Boise	0	0	-----	0	0	0	0	0	0	0	0	0
Colorado:												
Denver	1	0	5	0	0	0	2	1	1	0	0	22
Pueblo	0	0	-----	0	0	0	1	0	0	0	0	3
Utah:												
Salt Lake City	0	0	-----	0	2	0	2	0	3	0	0	31

City reports for week ended July 24, 1943—Continued

	Diphtheria cases	Encephalitis, fectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	1	0	------	1	11	0	2	1	3	0	0	26
Spokane	0	0	------	0	8	2	1	0	4	0	0	15
Tacoma	0	0	------	0	1	0	0	0	1	0	0	1
California:												
Los Angeles	0	0	6	0	55	4	4	13	16	0	0	43
Sacramento	0	1	------	0	1	0	0	4	0	0	0	8
San Francisco	0	0	1	0	19	3	3	3	3	0	0	14
Total	37	2	29	8	1,182	79	247	52	243	2	28	1,266
Corresponding week, 1942	48	5	30	6	748	19	[1] 293	24	225	2	35	1,421
Average, 1938–42	56	------	28	[1] 7	[2] 811	------	[1] 238	------	278	2	40	1,364

[1] 3-year average, 1940–42.
[2] 5-year median.

Dysentery, amebic.—Cases: Boston, 1; New York, 1; Los Angeles, 1.
Dysentery, bacillary.—Cases: Buffalo, 4; New York, 7; Syracuse, 1; Cincinnati, 1; Detroit, 2; Baltimore, 2; Washington, 1; Richmond, 1; Charleston, S. C., 43; Nashville, 4; Los Angeles, 7.
Dysentery, unspecified.—Cases: Washington, 1; Birmingham, 1; San Antonio, 10.
Leprosy.—Cases: New Orleans, 1.
Rocky Mountain spotted fever.—Cases: St. Louis, 1.
Tularemia.—Cases: Chicago, 1.
Typhus fever.—Cases: Charleston, S. C., 5; Brunswick, 1; Savannah, 2; Birmingham, 1; Little Rock, 1; New Orleans, 2; Shreveport, 1; Dallas, 2; Houston, 6.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1942, 34,541,100)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever, case rates	Whooping cough case rates
			Case rates	Death rates								
New England	13.4	0.0	2.7	5.4	344	18.8	37.6	5.4	126.2	0.0	5.4	226
Middle Atlantic	4.9	0.0	1.3	0.4	168	14.3	36.6	2.7	27.7	0.0	2.2	128
East North Central	7.6	0.0	1.2	0.6	214	7.6	27.4	2.9	37.4	1.2	4.1	210
West North Central	3.9	0.0	0.0	0.0	201	19.5	54.7	7.8	23.5	0.0	3.9	205
South Atlantic	3.4	1.7	10.3	0.0	145	13.7	35.9	3.4	30.8	0.0	3.4	374
East South Central	5.9	0.0	0.0	11.9	24	0.0	77.2	0.0	17.8	0.0	23.8	178
West South Central	2.9	0.0	14.7	2.9	35	0.0	76.3	32.3	17.6	0.0	17.6	56
Mountain	8.4	0.0	42.0	0.0	101	0.0	50.4	8.4	33.6	0.0	0.0	471
Pacific	1.7	1.7	12.2	1.7	166	15.7	17.5	36.7	47.2	0.0	0.0	187
Total	5.6	0.3	4.4	1.2	178	11.9	37.3	7.8	36.7	0.3	4.2	191

PLAGUE INFECTION IN GRANT COUNTY, OREG.

Plague, infection has been reported proved in tissue from 1 ground squirrel, *C. oregonus*, taken June 20, 1943, on State Highway No. 70, south of Seneca, Grant County, Oreg.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (*rodent*).—A rat found on June 30, 1943, in Paauhau, Hamakua District, Island of Hawaii, T. H., has been proved positive for plague. Two rats found on July 9 and July 13, respectively, in the Makawao District, Island of Maui, T. H., have also been proved positive for plague. A delayed report states that 2 plague-infected rats were found on November 27, 1942, and March 23, 1943, respectively, in Makawao District, Island of Maui, T. H.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended July 10, 1943.—During the week ended July 10, 1943, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		13	1	73	112	18	39	18	48	322
Diphtheria		8	6	16	1	6				37
Dysentery (bacillary)				2						2
German measles		1		5	38	2	3	7	12	68
Influenza		3			20				6	29
Measles		83	3	139	642	70	55	232	98	1,322
Meningitis, meningococcus				1	2				2	5
Mumps		55	2	17	153	34	21	32	28	342
Poliomyelitis					1					1
Scarlet fever		13	11	68	54	26	17	21	9	219
Smallpox								1		1
Tuberculosis (all forms)	3	8	8	92	50	12	9	3	13	198
Typhoid and paratyphoid fever				23	2	1				26
Undulant fever				1	2				1	4
Whooping cough				93	100	24	17	42	29	305

SWEDEN

Notifiable diseases—May 1943.—During the month of May 1943, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	8	Poliomyelitis	15
Diphtheria	140	Scarlet fever	2,551
Dysentery	90	Syphilis	55
Gonorrhea	1,561	Undulant fever	7
Hepatitis, epidemic	381	Weil's disease	4
Paratyphoid fever	154		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Plague

Basutoland.—An outbreak of pneumonic plague occurred in Basutoland between June 12 and June 30, 1943, in a native village 18 miles south of Mafeteng. The number of cases was not stated in the report but all cases proved fatal.

Peru—Libertad Department.—During the month of May 1943, 3 cases of plague with 2 deaths were reported in the city of Trujillo, Libertad Department, Peru. No human cases were reported for the month of June 1943, though plague-infected rats were found in the same locality.

Smallpox

Algeria.—For the period June 21–30, 1943, 78 cases of smallpox were reported in Algeria.

Indochina.—For the period June 21–30, 1943, 119 cases of smallpox were reported in Indochina, including 8 cases in Annam, 17 cases in Cambodia, 78 cases in Cochinchina, and 16 cases in Tonkin.

Typhus Fever

Algeria.—For the period June 21–30, 1943, 184 cases of typhus fever were reported in Algeria. During the month of April 1943, 28 deaths from typhus fever were reported in Algiers, Algeria.

Bulgaria.—For the period July 8–14, 1943, 42 cases of typhus fever were reported in Bulgaria.

Hungary.—For the week ended July 17, 1943, 10 cases of typhus fever were reported in Hungary.

Iraq.—For the week ended July 3, 1943, 20 cases of typhus fever with 1 death were reported in Iraq.

Rumania.—For the period July 16–23, 1943, 100 cases of typhus fever were reported in Rumania.

Slovakia.—For the week ended July 10, 1943, 9 cases of typhus fever were reported in Slovakia.